A Concise History of Chemistry. By T. P. HILDITCH. Pp. 263, 12mo. New York, D. Van Nostrand Co. 1911.

This little treatise is an attempt to lay before students of chemistry a condensed summary of chemical history. In many respects it is likely to be a useful book, although its conciseness is often an obstacle to intelligibility. Its use demands a rather wider range of knowledge than the average student is likely to possess. The chapter upon the earlier history of chemistry, and the evolution of the science, covers familiar ground, but with much omission of detail; the chapters dealing with more specific subjects are very unequal in value. The author is an organic chemist, and therefore the chapter upon organic chemistry is remarkably full and well handled. It includes a number of tabular statements illustrating classes of compounds, which will doubtless be found valuable for reference. The chapter on inorganic chemistry is much less satisfactory, and hardly up to date. Apart from a brief reference to the use of the rare earths in incandescent lighting, there is little or nothing relative to the modern utilization of the less common metals, and the paragraph dealing with synthetic mineralogy is even misleading. Physical chemistry receives rather better treatment, but even here the phase rule is given inadequate space and in the index it is credited to Wolcott Gibbs. This error, which may be due to the indexer rather than to the author, is one of several indications that Mr. Hilditch is unfamiliar with American work. For example, Classen is credited with the introduction of electrolytic methods of chemical analysis, an advance which was really initiated by Wolcott Gibbs, and to which Edgar F. Smith has been a chief contributor. So also, although Richards is barely mentioned on page 202, his name is omitted from the tabular statement of atomic weight methods which follows. In spite of these defects the volume may be serviceable to advanced students.

F. W. CLARKE

An Introduction to the Chemistry of Paints. By J. NEWTON FRIEND, Ph.D., D.Sc. New York, Longmans, Green & Co. Pp. 204, 8vo.

This book is designed to present this subject to those who have had no training in physics or chemistry, and may be regarded as an unqualified success. It makes no claim to be encyclopædic, and yet one finds terms and descriptions not given in much larger works.

One or two errors have crept in, such for example as the saponification numbers (p. 126) being given as 19.3, etc., when they are ten times as large: another is the position of the thermometer bulb in Fig. 16 which is much too low.

It is an excellent book and may be cordially recommended to all desiring information in this branch of technology.

A. H. GILL

THE WORK OF THE MARINE BIOLOGICAL STATION OF THE U. S. BUREAU OF FISHERIES, AT BEAUFORT, N. C., DURING THE YEAR 1910

A NUMBER of the investigations of the preceding year were continued and several new lines of work were begun. The equipment of the laboratory was maintained and a number of additions were made to the same. A launch, operated by two gasoline engines, was substituted for the steam-launch formerly used. The new launch is of small draft, which feature enables it to be used for dredging and for other operations in the vicinity of Beaufort. In addition to this vessel, the station has been equipped with a motor-boat, a sailboat and twelve rowboats.

During July and August the laboratory was supplied as usual with electric lights. During the same period a mess was conducted at the station for the use of the scientific staff. The cost of table board for each member was five dollars per week, the same as during the preceding year. The laboratory was supplied with running fresh and salt water throughout the year. The small storage ca-

pacity of the salt-water tank has for several years made it necessary to pump water from the harbor at times when it was unsuited for experimental work. It is possible that a tank of 10,000 gallons capacity will be erected.

The library was increased by the addition of a number of publications and by the receipt of reprints, the latter in many cases contributed by the authors.

The work on the molluscan fauna, noted in the report for last year,[1] was continued. The laboratory now has a nearly complete collection of the lamellibranchs of Beaufort correctly identified and labeled for study and reference. The collection includes a number of species collected some distance off-shore by the Fisheries Steamer *Fish Hawk*. The identifications were either made or verified by Dr. Wm. H. Dall, of the National Museum. Some progress on the gastropods of the region was made along similar lines.

The experimental work on the culture of the diamond-back terrapin was continued and considerable success was attained. About 270 young terrapins were hatched during the season, and at the close of the year the whole stock was in a thriving condition. A portion of the terrapins hatched during 1909 showed excellent growth during 1910. Preparations were begun to enlarge the scope of the work, which will include the construction of two additional concrete pounds. These pounds will be of permanent service to the laboratory for numerous lines of scientific work, in case they can be spared for other than the original purposes. As these pounds are supplied with fresh sea water at each high tide they would make excellent vivariums for keeping marine animals under nearly natural conditions, and they would at the same time be subject to control. The terrapin work has been under the general direction of Professor W. P. Hay, of Washington, D. C.

In cooperation with the U. S. Weather Bureau a daily record of the maximum and minimum temperatures and of the rain-fall, as well as of other miscellaneous meteorological phenomena, has been kept. This work has been carried on without interruption since the summer of 1905. Some attention was given to the cultivation of the oyster in Pamlico and Core Sounds. An inquiry was also made in regard to the character of fossil remains excavated during the process of construction of the new canal connecting Beaufort Harbor with the Neuse River.

The facilities of the laboratory were utilized by a number of investigators, either for independent research or for the scientific work of the bureau. They have kindly furnished abstracts of their work, which are included herewith.

Professor H. V. Wilson, of the University of North Carolina, carried on an investigation for the bureau dealing especially with the regenerative power of the tissues in hydroids. Professor Wilson had shown that when the tissues of certain sponges are forcibly broken up into their constituent cells, the cells will re-unite and form plasmodial masses which differentiate into perfect sponges. It seemed desirable to learn whether this power was possessed by the tissues of other aquatic forms. The investigation showed that hydroid tissues have this power.

Experiments were conducted on two hydroids, *Pennaria tiarella* McCrady and *Eudrendrium carneum* Clarke. The phenomena were essentially the same in the two forms. The cells and small cell masses into which the hydroid flesh is broken up reunite and form masses, the size of which is in a measure under control. These secrete a perisarc. As compared with the corresponding masses in certain sponges they are subject to great mortality. Some survive and after a few days give rise to hydranths with the characteristics of the species.

The inquiry was extended to learn what power of fusion lies in the forcibly separated cells of the alcyonarian, *Leptogorgia,* and in those of the immature gonad in *Asterias.* In each case active fusion goes on between the cells and cell lumps into which the flesh has been broken up, and masses are obtained which acquire a smooth surface. These were

[1] Science, May 6, 1910.

kept alive in laboratory dishes for some days, but underwent no further change.

Dr. E. P. Lyon and Mr. L. F. Shackell, of St. Louis University, worked upon problems connected with the fertilization of the ovum, directing their attention particularly to the chemical differences between fertilized and unfertilized eggs, using for the most part sea-urchin material.

A large amount of material for chemical analysis was collected which is to be worked up in the Physiological Laboratory of St. Louis University; also at Chicago through the cooperation of Professor Waldemar Koch, of the University of Chicago.

Messrs. Lyon and Shackell studied the changes in permeability occurring in eggs resulting from fertilization, and a preliminary article on this work was published in SCIENCE, August 19, 1910.

Dr. E. W. Gudger, professor of biology and geology, State Normal College, Greensboro, N. C., spent ten weeks at the laboratory beginning May 25.

Owing to the difficulty in getting eggs and embryos in May and early June, he was unable to complete his series for the life history of the gaff-topsail catfish. He now lacks only the segmentation and the earliest invagination stages. He was very successful, however, in hatching the eggs and rearing larvæ.

He was also successful in getting about half the stages for the life history of the butterfly ray, and hopes to complete this series next season. Some of these larvæ are very extraordinary in form.

In his work with the spotted sting ray, he was fortunate in obtaining three perfect specimens, two of them alive. From these it is hoped that certain variations in color, spots and teeth may be explained.

Careful photographic records were made of all the material referred to above, and an artist (Mr. E. A. Morrison, Jr., of Baltimore), under a grant from the Carnegie Institution, spent two weeks making drawings, chiefly of early stages of the gaff-topsail catfish.

Dr. H. S. Davis, of the University of Florida, worked at the laboratory during portions of July and August. The time was spent in examining fishes for parasitic protozoa and in observations on the morphology and life history of the parasites found, the work being largely of a preliminary nature to serve as a basis for further more detailed investigations.

A total of 26 species of fishes were examined for protozoan parasites. In the case of several of the more common species many individuals were examined, but with the rarer species the investigation was often necessarily limited to the examination of one or two specimens. Most of the parasites found were Myxosporidia, and of the 26 species of fish examined 14 were found to be infected with these parasites. As is usually the case, the gall-bladder was found to be most commonly infected, 13 out of the 14 species showing infection of this organ. In 2 species both the gall- and urinary-bladders were infected, but, of course, by different species of Myxosporidia. In a few cases the gall-bladder was found to be simultaneously infected with 2 species of Myxosporidia. In most cases the percentage of infected individuals was high, sometimes reaching 100 per cent. This was found to be especially true of the adults which were much more commonly infected than the young of the same species. It is significant that, in the case of those species in which Myxosporidia were not found, usually only one or two individuals were available for examination and these were often immature.

In the case of all the species of fish found to be infected no myxosporidian parasites have previously been recorded.

The Myxosporidia found belong to 6 genera, as follows, the species in many cases being apparently undescribed: *Sphærospora, Sphæromyxa, Chloromyxum, Ceratomyxa, Myxobolus* and *Henneguya*. In several cases, on account of the absence of material in the proper stages, it was found impossible to determine the genus.

In at least two cases the same species of Myxosporidia was found to occur in two or more species of fish.

A large amount of material was preserved with a view of working out the life history of several species as far as possible, and is being worked up as rapidly as time will permit.

The fresh blood of a large number of individuals was carefully examined for trypanosomes or Hemosporidia, but with uniformly negative results.

Dr. James J. Wolfe, professor of biology, Trinity College, Durham, N. C., spent the months of July and August at the laboratory. Dr. Wolfe collected material and began studies with a view to publishing a complete life history of *Padina*. The microscopic technique was worked out and a beginning made on the cytological side of the problem. In addition sixty-six cultures consisting of germinating tetraspores, fertilized and unfertilized eggs, were started in the laboratory on oyster shells and later transferred to the harbor for the purpose of testing by cultural methods the theory of alternation of generation and also the vitality of eggs which germinate parthenogenetically. The cultures which survived were collected and forwarded to Dr. Wolfe for examination later in the season. Contrary to published notices, female plants were found here in abundance. These bear a close resemblance to tetrasporic individuals—a fact which probably accounts for their having been overlooked. Contrary also to published notices, it was found rather late in the season that there is a regular succession or periodicity in the production of the sexual elements.

Dr. H. S. Colton, of the University of Pennsylvania, worked at the laboratory during the spring. During the previous winter at the University of Pennsylvania, Dr. Colton had been working on the morphology and physiology of the pyloric gland of the ascidian, *Botryllus*. This organ is composed of branching tubules with blind endings. These tubules ramify over the walls of the intestine, opening by means of a single duct into the stomach. This gland he has found to have the characters of an excretory organ in *Botryllus*.

While at Beaufort last spring, he was able to extend these observations on to other forms of Tunicates—*Amaroucium, Perophora, Ascidia, Styela* and *Molgula*. The result of these observations helped confirm the conclusion arrived at by the study of the organ in *Botryllus*.

Dr. J. M. Wilson, of Washington, D. C., made collections and preparations of selachian brains for the purpose of comparison with the teleostean brain, especially that of *Ameiurus*.

Mr. W. H. Kibler, of Guilford College, collected material for the study of the origin of the sex cells of fishes. Consecutive stages in the development of the toadfish were obtained, together with certain stages from the blenny and *Fundulus*.

Mr. L. F. Shackell, instructor in physiology, St. Louis University School of Medicine (in addition to his collaborative work with Dr. Lyon), collected considerable material for a study of the nutritive value of the edible crab, *Callinectes sapidus*. A study is also being made on the chemical changes taking place in *Callinectes* during the moulting period. Most of the analyses are being made in St. Louis.

Mr. Peter Okkelberg, of the University of Michigan, studied principally fishes and fish parasites. Most fishes were found to be infested with parasites and collections were made for future study.

A general study was also made of the local fauna. Note was taken of the distribution and habits of the different forms, with special reference to their adaptation to environment. Ample opportunity was furnished for the study of live animals under control. The structure and development of many forms were also studied.

Protozoans, jellyfish and larvæ of different kinds were obtained by towing, and a study was made of the material brought up by the dredge in various parts of the harbor. The extensive shoals and beaches were frequently surveyed and all the material found was studied as far as time permitted.

Mr. Raymond Binford, Johns Hopkins University, continued the study of the life histories of the crabs of Beaufort, especially that of *Menippe mercenaria*. By a later study of the material killed and preserved during the summer, the processes of fertilization and gastrulation in this crab are being worked out.

In experiments in which eggs were subjected to differences of temperature, those which were kept a few degrees above normal hatched nine days after they were fertilized, while those kept below the normal hatched on the thirteenth day after fertilization.

Some twelve hundred of these crabs were caught in the waters about the Beaufort harbor during the summer.

Mr. J. D. Ives, instructor in biology, Wake Forest College, made observations on the regeneration of nemerteans and *Amphitrite* during the month of August. Sections of nemerteans were found to regenerate readily. The anterior surfaces of the sections were found to regenerate but a small amount of new material compared with that formed by the posterior surfaces. The posterior surfaces of the sections regenerated rapidly. In about four weeks, sections of worms not over one half inch long were found to more than double their length with new material.

The tentacles of *Amphitrite* when pulled off were found to regenerate readily. In about ten days or two weeks after removal, the tentacles attained nearly an inch or about half of their normal length. When the entire tentacle bearing somite is cut off, the worm lives almost as well as when only the tentacles are removed. When the somites bearing both the tentacles and the first pair of branchiæ were cut off, some few specimens lived for over two weeks.

HENRY D. ALLER

THE BIOLOGICAL EFFECTS OF RADIUM[1]

AMONG the first discoveries made after the production of concentrated radium salts was that radium is capable of causing intense effects upon living tissues. We were not unprepared for such a discovery in the case of radium because similar phenomena had been observed early in the study of X-rays. In the case of X-rays the discovery had been totally, and very unfortunately, unexpected. The early burns from radium were of the same character as X-ray burns, and later detailed study has shown that the effects upon tissues of the two agents are practically identical. An appreciation of this fact is useful at the outset of a consideration of the biological effects of radium; it gives one at once a large number of analogous facts that have been well studied and, because of the more extensive study that has been made of the biological effects of X-rays, enables one to correlate more satisfactorily some of the isolated observations upon the actions of radium. Because the gross effects of radium, which furnish us many valuable facts, can be studed in the skin, and because the effects upon the various tissues of the skin give us the most comprehensive view of the biological effects in general of radium, it is conducive to clearness to consider first the effects of radium upon the skin, meaning by the skin in this connection the human skin or skin of similar structure of other animals.

When the human skin is exposed for a sufficient length of time to an active radium salt a peculiar and definite reaction is set up, of which the first striking feature is that it does not develop until after a relatively long period of quiescence—as a rule about two weeks. In a skin containing a considerable amount of pigment, there is first an increase of pigment, shown by an ordinary "tanning" of the exposed surfaces. If there are any freckles or pigmented spots in the exposed area, these become darker. Along with this pigment stimulation there occurs a reddening of the skin, with a feeling of irritation and burning such as one has from sunburn. The reaction may stop at this point and after a few days gradually subside; the redness and irritation diminish, there is some scaling from the surface and in a few days more no evidence of the reaction remains,

[1] Address before the Illinois State Academy of Science, Chicago, February 18, 1911.